

A Comparison of Soybean Production and Related Costs in the United States and Brazil

Kimberly M. Gable
The Ohio State University
College of Food, Agricultural, and Environmental Sciences
Honors Project
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G324

David Hahn
Academic/Project Advisor

Kimberly M. Gable
Kimberly M. Gable

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Introduction

Soybean oil and meal have been of great nutritional importance for both animals and humans. As attitudes change toward foods and their benefit or harm to humans, consumers become more conscience of what they are eating. Soybean oil producers sparked a campaign to educate consumers on the benefits of soybean oil. Soybean oil ranks first among all edible oils with 26% of the world market in 1991. The United States is the largest producer of soybean oil. As the demand for soymeal and soyoil increases, the United States continues to produce the majority of these products but increased competition has been encountered from Brazil. The share of the market that the United States holds is decreasing while Brazil's share is increasing. This has created a great impact on the future outlook for soybean production in the United States.

For many years, the United States has been the main producer of soybeans. In 1990, about 1,925,947,000 bushels of soybeans were produced accounting for the largest farm income crop. The United States accounts for 50% of the world's soybean crop while Brazil is the second largest producer. The demand for soybeans is expected to grow because of increasing world demand, increasing world population, increasing income, and increasing desire to improve diet. However, as Brazil is becoming more of an efficient competitor in the world market, the United States is slowly losing its dominant role in production of soybeans. (Larson et al. pp. 201-231)

The soybean market has changed dramatically in the last few years. The United States has turned more towards specialized ways to produce its soybeans with higher costs for example, producing tofu beans for Japan. By contrast, in Brazil production of

soybeans is still in mass production with lower input costs. With these low costs and ability to mass produce soybeans, Brazil is becoming more of a world competitor and gaining comparative advantage.

Problem Identification and Justification

As we look toward the future, questions of how the United States will compete in the world soybean market are raised. Because Brazil is the second largest exporter of soybeans and becomes increasingly efficient in production of soybeans, will the United States lose its comparative advantage and fall to second best? By looking at the production techniques in Brazil, as well as the United States, a comparison can be made and therefore the impact this has on world trade will be assessed. There are numerous market opportunities for soybeans in world trade. By examining these possibilities, the impact on world production will be more fully realized.

As the United States is facing increasing competition from Brazil, it is losing its traditional bean market and this has a tremendous impact on soybean producers. The Midwestern farmer is greatly impacted by this situation since 67% of all soybeans produced in the United States are produced in Illinois, Iowa, Minnesota, Indiana, Ohio, and Missouri. (Smith p. 357) Therefore, it is important to see how this problem will affect the farmers as they try to decide how to produce and how much to produce.

Objectives

- 1.) To identify locations, quantities, and management techniques used in soybean production in the United States and Brazil by comparing and contrasting the various methods used.
- 2.) To compare soybean production costs, revenues, and marketing in the United States and Brazil.

Procedures and Methods

Data was collected from a detailed literature review and interviews with US producers and Brazilian producers. Literature sources include works from Dr. Donald Larson, Philip Warnken, the Ohio Soybean Council, the American Soybean Council as well as other assorted books and web sites.

The summer of 2000 was spent in Brazil on a study abroad program. This activity permitted interviewing Brazilian agriculture professors, experts at a soybean research center, and farmers.

Findings

The United States

In the late 1700s, soybeans were first introduced to the United States. They were brought from China by Samuel Bowen and were first planted in Georgia by Henry Yonge. Originally the soybean was used as a forage crop which would produce one crop of hay or could be used as green manure. The soybean slowly began to spread across the United States, and in 1829 farmers began to plant soybeans as a crop. Throughout the early 1900s, many discoveries were made about the crop such as the soybean was a good source of protein and oil. In the 1940s soybean production really gained popularity.

During World War II world trade of soybean oil was disrupted. The value of soybeans in the United States skyrocketed and hence production increased. Prior to 1930 only 25% of soybeans planted were harvested for seed. However in 1942, 72% of planted soybeans were harvested for seed. Production from 1940 to 1945 grew by 246%. As machine power became more readily available, the ability of the soybean to resist drought, and the passing of President Roosevelt's New Deal, the soybean industry grew even more.

New cultivars and uses for soybeans were introduced and the soybean allowed farmers to diversify. It also gave them a way to spread their risk of financial ruin due to crop failure or overproduction of one cash crop. Because of the increased popularity and increased production of soybeans the United States became the world leader in soybean production and exports. The United States has enjoyed this title for many years. However increased competition became evident in the 1970s when Brazil entered the soybean market. Brazil has been a threat ever since its entrance in the industry and poses an even more serious threat to the future of the soybean industry in the United States today.

-Production: The United States offers a good environment for growing soybeans, and they are grown in many areas of the United States. The soybean belt in the Midwest produces 70-75% the United States' soybeans. Soybeans are typically planted in May/June and harvested in September/October. Many farmers use no-till practices and Round-Up Ready soybeans. This allows for better overall performance and higher yields. Yields can range from 25 to 60 bushels per acre with the average in the mid 40s. The current technology available allows farmers to be profitable while producing a high quality product. During the past 25 years soybean production has steadily increased, see Table 1.

Table 1: Soybean Production in the United States

Year	Million Bushels
1975	1,548
1985	2,099
1995	2,174

1996	2,380
1997	2,689
1998	2,741
1999	2,643

Source: Soy Stats www.ag.uiuc.edu/~stratsoy

After harvest, farmers in the United States have a variety of options on how to market their grain. Getting the crop to market is very easy to do in the United States because of its well developed infrastructure (road, waterway, and railroad systems). Local elevators, many owned by farmer cooperatives and regional grain merchandisers, are normally where farmers sell their soybeans. Marketing contracts and options are tools farmers use to hedge some of their risks and secure a better price. Farmers often feel they are successful at marketing since they are able to stay in business and get good prices throughout the year.

-Soybean Oil and Meal: The United States leads the world in soybean oil exports. At one time the United States exported 15% soybean oil, but in 1970 this decreased with increased competition from Brazil and Argentina. In 1982-83, 75% of the United States refined fat/oil output was soybean oil. Even with increased competition, soybean oil has continued to be an important component of the United States soybean market. In 1987-88 total fats and oils in the United States was 14.2 billion pounds while 10.4 billion pounds of the total was soybean oil. (Larson et al. p. 219) In 1999 the United States consumed 15,595.6 million pounds of fats and oils of which 12,816.5 million pounds was soybean oil. (Soy Stats) Prices of other vegetable oils in the United States have not seemed to affect the demand for soybean oil.

Much like soybean oil, soybean meal is very important to the soybean market. Large amounts of soybean meal are used for livestock feed each year since the 1950s. In the United States soybean meal is a vital product. However in 1970, United States exports, which at one point were 20%, also saw a decline as competition increased in South America.

-Ohio Farmer Production Costs: Production costs for soybeans are low when compared to other countries. A budget for costs for an Ohio soybean farmer follows.

Table 2: Production Costs for an Ohio Soybean Farmer
(US\$/acre)

Yield	30	40*	50
Variable Costs:			
Seed	22	22	22
Fertilizer	20	23	28
Chemicals	23	23	23
Trucking- Fuel Only	1	1	2
Fuel, Oil, Grease	7	8	8
Repairs	5	5	6
Miscellaneous	12	13	14
Interest on Capital	3	4	4
Hired Labor	0	0	0
Total Variable Costs	94	100	107
Fixed Costs:			
Labor Charge	15	15	15
Machinery and Equipment Charge	41	41	41
Land Charge	70	85	100
Management Charge	7	9	11
Total Fixed Costs	133	150	167
Total Costs	227	250	275

*these figures will be used when comparing to Brazil

Source: OSU Soybean Production Budget

This budget was verified with Ohio farmers and is accurate with their budgets. However, some farmers do not figure a management charge because they see that as priceless. The costs that farmers feel have the most impact are the cost of land and the

variable cost specifically chemicals. Fuel and miscellaneous expenses were seen as having little impact on decisions. Also, management and labor charges were also seen as having little impact since some farmers do not figure these costs into their expenses. Ohio farmers are constantly looking to lower costs in order to be more profitable.

- Infrastructure: For many years the United States has been seen as having superior highways, railroads, and river systems. Its infrastructure continues to be superior to Brazil's, but it is slowly deteriorating. The United States is at a point in its history when it must decide if it wants to invest in its infrastructure in order to maintain it. Public opinion shows that people are beginning to question if they want dams and barges on the rivers due to environmental damage. If the United States chooses not to invest in and maintain its current infrastructure it will lose its competitive edge as Brazil invests in a modern transportation system.

In the future, if the United States wants to increase soybean production, yields must be improved. There is no more land for expansion in the United States and every year some land is even taken out of production. Researchers will have to create soybeans that are higher yielding. This will most likely be done with the aid of biotechnology, which leads to a variety of concerns such as health and consumer concerns. It will be hard for the United States to increase its production dramatically in the future.

Brazil

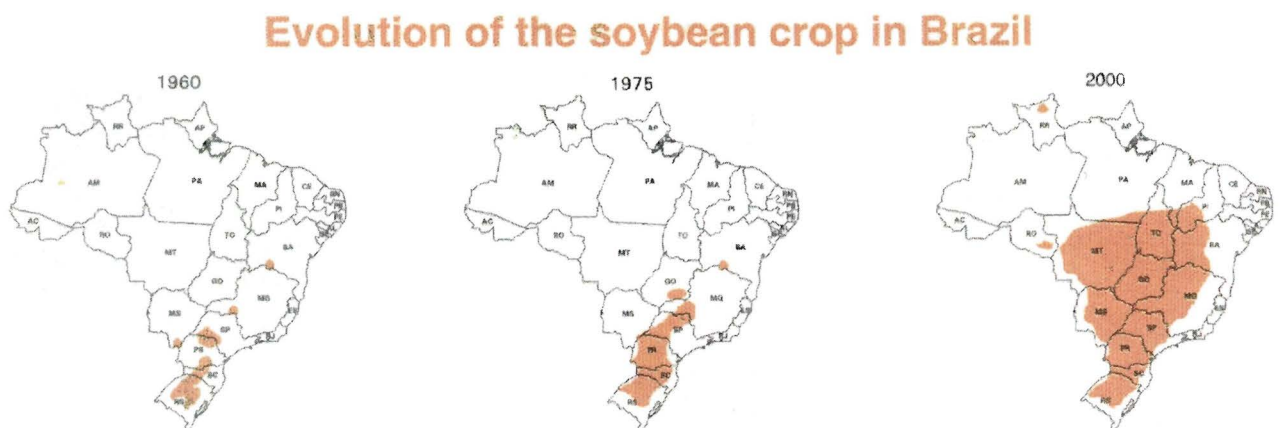
Soybeans reached Brazil in the late 1800s and in 1908 they were being produced. Soybeans were first produced in Rio Grande do Sul and Santa Catarina as forage, green manure, and hog feed. However, soybeans were not officially reported in statistics until 1945. In the 1950s and 1960s, there was genetic material interchange between the United States and Brazil. Until 1973, soybeans were produced in Brazil with little effect on the

world market. Then in 1973 Brazil experienced a time of rapid increase in soybean production and exports. From the 1960s to the 1980s, soybeans were a way for Brazil to save its foreign exchange, increase foreign exchange earnings, improve the national diet, stimulate industrial development, hold down the food price, and occupy territories.

(Warnken p. 10)

Today, soybeans are produced in two main areas, which include the south/south-central region and the central-western/northern or cerrado region. The south/south-central region is the traditional production area, which includes the states of Rio Grande do Sul, Santa Catarina, Parana, and Sao Paulo. The cerrado region is growing very rapidly and includes the states of Minas Gerais, Mato Grosso do Sul, Mato Grosso, Goias, Tocantins, Distrito Federal, Bahia, and Maranhao. A third area, which includes the states of Piaui and Rondonia, has the potential for soybean production but few soybeans are currently produced in these areas. Areas used in production can be seen in the following maps.

Figure 1: Evolution of the Soybean Crop in Brazil



Before the 1980s, the cerrado region was considered to be scrublands and closed off from the rest of Brazil. However, with the building of Brasilia and more roads the area opened up and agriculture expanded. The cerrados have been the most dynamic production area of Brazil since the 1980s and has accounted for nearly all of Brazil's soybean production growth. This region experiences a dry season that lasts for three to five months. Soybeans are a good crop for this region because they are less sensitive to short dry spells, there is less of a price risk with soybeans, and soybean production is less labor intensive than corn or rice.

Large to very large farms are common in the cerrado area although there are some small farms also. Sixty percent of the farms are large consisting of 1000 hectares (2470 acres) or more. Modern mechanical, chemical, and biological technology is used and production is completely mechanized. Soybeans are normally grown continuously in this area which leads to problems with weeds and insects. The soil in this region is low in nutrients and is acidic. In order to begin planting soybeans in this region, 2 tons of limestone per hectare, 100-200 kilograms of P_2O_5 per hectare, 60 kilograms of K_2O per hectare, and trace elements are needed. After that, 1-2 tons of limestone per hectare is needed every four years and 60 kilograms of P_2O_5 per hectare, 60 kilograms of K_2O per hectare, and micronutrients are needed annually. Even though this area is highly productive, it may not be economically viable to open new lands for cultivation and viable production on the land may not be sustainable both economically and ecologically. When opening new land for crop production farmers are only allowed to clear 80% of the land. The other 20% must be left in natural vegetation. This practice is done to try to combat some of the environmental concerns in Brazil.

-Production: Production techniques are very similar to the United States. Much of the production is done by mechanization and therefore little labor is needed. Many farmers practice no-till techniques, also. If no-till is used, often times a cover crop will be planted in the winter which is not harvested. Then the soybeans are planted by no-till in the spring. Because of erosion, no-till techniques are highly recommended. Typically soybeans are planted in September/October and are harvested in February/March, which is the opposite of the production cycle in the United States. Yields can range from 35 to 60 bushels per acre with the average in the high 30s. During the past 25 years soybean production has increased approximately three fold, see Table 3.

Table 3: Soybean Production in Brazil

Year	Million Bushels
1975	413
1985	518
1995	887
1996	1,003
1997	1,194
1998	1,150
1999	1,139

Source: Soy Stats www.ag.uiuc.edu/~stratsoy

After harvest, there are some marketing tools available to farmers however they have fewer than farmers do in the United States. Brazilian farmers could not participate in forward markets until recently. Many local cooperatives and large companies are present in Brazil to provide marketing services to Brazilian farmers. Some farmers choose to pool their crop together and then sell to a large company. While other farmers

rely on other means to sell their soybeans and they are worried about the large companies like ADM and Cargill buying large portions of the soybean crop.

-Soybean Oil and Meal: Soybean oil is important in many areas of the world especially in Brazil. Brazil did not export soybean oil until 1970; however, they have grown to become third in soybean oil exports. The increased demand for vegetable oil and the thought that Brazil's soybeans had better oil and protein content has led to the success of Brazil's soybean oil. Fifty percent of Brazil's exports go to China as unrefined soybean oil. (Warnken p. 92) Domestic use of soybean oil is also very important in Brazil. Ninety percent of households use soybean oil because it is less expensive and since oils are not blended in Brazil. However, there have been some problems with acceptance of the oil. Therefore state agencies such as Embrapa are working hard to educate Brazilians about soybean oil and promote the oil to them. In Brazil soybean oil is the 4th most important item in a consumer food basket. (Warnken p. 121) The USDA predicts that Brazil will continue to produce more soybean oil but more of this oil will go towards domestic consumption.

Brazil is the leading exporter of soybean meal. It exports meal to over 50 countries mainly in Europe. The world exports 32% of its soybean meal while Brazil exports 75% of its soybean meal. In 1972-73 soybean meal prices, which are related to Chicago Board of Trade prices, increased 105% in Brazil and therefore exporting meal has been quite lucrative for the country. As poultry production increases the demand for and production of soybean meal is expected to increase. Though, the USDA feels that much of the increased soybean meal will be consumed domestically.

Brazilian farmers' production costs are considerably less when compared to the United States. A table of production costs follows.

Table 4: Production Costs for a Brazilian Soybean Farmer in Parana State
(US\$/acre)

Variable Costs:	
Seed	9.05
Fertilizer	19.15
Chemicals	24.31
Fuel, Oil, Grease and Repairs	16.34
Interest on Capital	11.43
Total Variable Costs	80.28
Fixed Costs:	
Labor Charge	3.15
Machinery and Equipment Charge	14.52
Land Charge	9.98
Management Charge	5.53
Total Fixed Costs	33.18
Total Costs	113.46

Source: CEPEA

-Management Techniques: Brazilian farmers are faced with many of the same management decisions as producers in the United States. Like producers in the United States, Brazilian producers try to lower production costs when possible. For Brazilian producers, costs are affected by the exchange rate, which can cause costs to increase or decrease. When costs increase, the level of technology used usually decreases, which results in lower yields. Because large amounts of limestone are needed to correct the pH level in the soil and large amounts of fertilizer are needed to correct for nutrient deficiencies, fertilizer and chemicals have the largest impact on production. Management costs currently have little effect on production decisions.

-Infrastructure: The infrastructure within Brazil is less developed than the infrastructure in the United States. The interior of the country is not opened up very well and there are many transportation routes that are not passable. The Amazon water system is huge yet many of those rivers are impassable. Also the road and railroad systems are

not very good. Refer to Figure 2 to see where current roads, railroads, and rivers are located.

Figure 2: Map of Brazil's Transportation Routes



The conditions of roads in Brazil are poorly constructed when compared to roads in the United States. Many are dirt based with large washouts. In 1996, there were 1.98 million kilometers of highways of which 1,795,860 kilometers was unpaved and 184,140 kilometers paved. Even though several of the roads are in dilapidating conditions, trucks haul 80% of Brazil's grain. This has caused trucking to be very inefficient. Currently Brazil is improving the road system in the northwest, but in order to improve the

conditions of all the roads the Brazilian government would have to spend billions of US dollars. Therefore the government is looking for alternative transportation routes.

Railroads in Brazil are not much better than the roads. Several short line railroads pass through southeast and northeast Brazil. However, under government ownership many of the railroads have been neglected and are in substandard condition. Some of the railways have been privatized and more railroads are being built though. In 1999, there were 27,882 kilometers of railroad tracks of which 4,057 kilometers were broad (1.6 meter) gauge, 23,489 kilometers were narrow (1.0 meter) gauge, and 336 kilometers were dual (1.6 and 1.0 meter) gauge. Furthermore, since the rail gauges of individual railroads are different many stops are required to adjust the wheels. Brazil has been changing to 60-ton railcars from 105-ton cars so they can pass on the poor quality railroads. Brazil is also working diligently at having a railroad that goes from western Brazil to Atlantic Ocean Ports as well as a railroad that links north and south Brazil. Even though Brazil is modernizing its railroads, it will probably continue to be low quality for several more years. Because railroads as well as roads have been the way most farmers have transported their soybeans, transportation costs are high.

-Transportation Costs: Costs increase drastically however when Brazilian farmers need to transport their soybeans. Much of this is due to Brazil's lack of infrastructure. The high costs can be recognized when compared with transportation costs in the United States, see Table 5.

Table 5: Comparison of the costs of transporting soybeans via truck-barge from Sapezal, Mato Grosso to Itacoatiara and to Europe versus from Jefferson, Iowa to New Orleans and Europe (May 12, 2000)
(US\$/bushel)

Maggi Group Sapezal to Itacoatiara, Brazil (Rio Madeira)		West Central Cooperative Jefferson, Iowa to NOLA (Mississippi River)	
Truck 560 miles to Porto Velho	\$0.68	Rail 200 miles to East Clinton, IL	\$0.20*
Transfer to barge	\$0.07	Transfer to barge	\$0.04
Barge 600 miles to Itacoatiara	\$0.34	Barge 1,450 miles to NOLA	\$0.22* **
Total to ocean ports	\$1.09	Total to ocean ports	\$0.46
Ocean to N. Europe	\$0.42	Ocean to N. Europe	\$0.39
Total to N. Europe	\$1.51	Total to N. Europe	\$0.85

*contract rail rate

**barge freight @ 135% tariff

Source: McVey, Baumel, and Wisner

The amounts shown in this table are very comparable to the transportation costs that would be encountered in Ohio since Ohio and Iowa have similar infrastructure. To combat the problem of extremely high transportation costs, Brazil is investing in their infrastructure.

Brazil's best option to reduce its transportation costs and to improve its infrastructure problems is to develop its river transportation systems. There are three main rivers that can be opened up for navigation in Brazil. They include the Rio Madeira that runs from the coast southwest to Porto Velho, the Hidrovia Paraguay-Parana that runs from Mato Grosso south to Buenos Aires, and the Hidrovia Araguaia-Tocantins that runs from Manaba to Brasilia and Rondonopolis. Please refer to Figure 3 for location of these rivers.

Figure 3: Map of Brazil



The Rio Madeira is a free-flowing navigable river, which is already in full operation. This river requires no public investment to keep its channels navigable. Nine-barge tows are able to move up and down the river and each barge can carry 2,000 tons of grain. There is a barge loading facility at Porto Velho and there is a small barge-to-ocean vessel transfer facility at Itacoatiara on the Amazon River. Both of these structures are modern facilities. (McVey et al. p. 2) The Rio Madeira can move from 2 to 3 million tons of grain each year without any investments. Therefore, this waterway has opened up Mato Grosso to the world soybean market. Even though the Rio Madeira offers the best chance for Brazil to solve its transportation problems, shipping rates on the river are quite high.

Currently there are plans to develop the Hidrovia Paraguay-Parana River. This river runs south from Mato Grosso into Paraguay and Argentina to Rosario, an export port in Argentina. A portion of the river passes through the Pantanal in Brazil, which is a

large and beautiful wetland. A barge loading facility in Morrinhos, which is in the middle of the Pantanal, is proposed to be built. Also, a road from Mato Grosso is planned to be constructed. Many agencies are fighting this development because of environmental reasons. Even though this river will likely be developed it will only offer limited value to Brazil. The value of development will be limited because the river narrows to the width of one barge for 30 miles, it frequently floods during the rainy season, there is no main channel, and if there was ever an accident in the Pantanal the reaction and environmental impact would be similar to that of the Exxon Valdez accident.

If the Hidrovia Araguaia-Tocantins would be developed, it would transport soybeans brought on trucks across the river from east central Mato Grosso to Xambioa, Tocantins. Then the soybeans would be trucked to Estreito, Maranhao. There they would be put on railcars and shipped to the port Sao Luis on the Atlantic Ocean to be put into ocean vessels. This mode of transportation would be higher cost than current transportation routes in Brazil and these costs would still be higher than transportation costs in the US. Industry leaders in Brazil believe that the Araguaia River will not be developed but the Tocantins River may be developed in the future. (McVey et al. p. 3)

-Expansion possibilities in Brazil: The expansion possibility for soybeans seems to be endless in Brazil. Brazil has 8,456,510 square kilometers of land area, which is slightly smaller than the size of the United States. The United States land area is 9,158,960 square kilometers. The cerrado region, which is the primary area for soybean production expansion, consists of 511 million acres of which 338 million acres is suitable for agriculture. Currently, 116 million acres are used for agriculture and of that 116 million acres, 24 million acres are used for annual crop production. In the 1998-99 growing season 14.8 million acres in the cerrado region was planted with soybeans. In

the future there will be an additional 222 million acres available for agriculture and 148 million acres of this area could be used for annual crops. The possibility of expansion is much larger than the area producing soybeans in the United States. The United States planted 72 million acres of soybeans in 1998 and 73.8 million acres in 1999. Also, the “land area available for row crops in the cerrado region is about five times the land currently being used to produce soybeans in Brazil.” (Whigham and Christmas p. 5)

-Restraints to Expansion in Brazil: Even though the land available for expansion is vast there are some restraints to expansion that Brazil must address before continuing to expand. Currently the international price for soybeans is low. If this remains to be the case Brazil may not want to produce more soybeans. With a low price it will not be as profitable to produce soybeans as some other crops may be. International price is a concern to Brazil, but infrastructure and transportation problems will need to be solved first in Brazil.

As discussed earlier, Brazil’s infrastructure is not as well developed as other countries. Therefore, Brazil is working to improve its roads, railroads, and river systems. The river systems offer the most potential in alleviating Brazil’s infrastructure problems.

Environmental concerns are also hampering expansion in Brazil. Much of the rainforest in Brazil has been destroyed by development. More and more people are becoming concerned with the destruction of natural resources in Brazil. Therefore non-governmental agencies are resisting development of transportation systems and land clearing. For example, the World Wildlife Fund is protesting the deepening of the Paraguay River because its flow would be increased, which would threaten the Pantanal Swamp, one of the world’s greatest wetland, in Western Brazil. (Friedland) Currently 20% of all developed land must be left in natural vegetation. As pressures increase, the

rate of land clearing may decrease and the amount of land required to be left in a natural state may increase. This could cause more problems for farmers wanting to plant more soybeans. This may also cause transportation as well as production costs to increase.

-Ways to Overcome Expansion Restraints: Brazil will likely continue to increase its soybean production simply because it has such a large production advantage when it comes to costs as compared with the United States. However, Brazil has been looking for ways to overcome its expansion restraints and further enhance its competitive position. It has looked to research as well as outside investment.

In order to become more competitive there is a large effort in Brazil for soybean research. Because much of the area used to produce soybeans is very dry, researchers are constantly introducing new seed that is better able to handle the high heat in Brazil. Embrapa is the leading soybean research station in Brazil; besides performing field trials, they also are researching ways to make soybean products more edible and new uses for the soybean. Embrapa reaches out to local farmers to teach them better farming techniques. They also teach farmer's wives how to use soybeans in their daily cooking.

Many firms outside of Brazil are investing in Brazil. Companies today are not limited to one country rather they are global companies. Therefore companies typically seen as American companies are investing Brazil's infrastructure. They are doing this because they see the potential Brazil has to offer and they want to secure the best possible deal for the company. In order to stay competitive these companies must invest in areas that hold the most potential for future profitability. Currently Brazil has that advantage so they are seeing an influx of investments within the country. These companies are building ports and investing in transportation systems in Brazil. Not only is Brazil seeing investment from large companies but it is also seeing investment from countries that are

receiving the majority of their soybeans from the US. These countries do not want to be held hostage by the United States' soybean prices therefore they are welcoming and encouraging competition from Brazil. All of this investment in Brazil will be very beneficial to the country and its soybean industry.

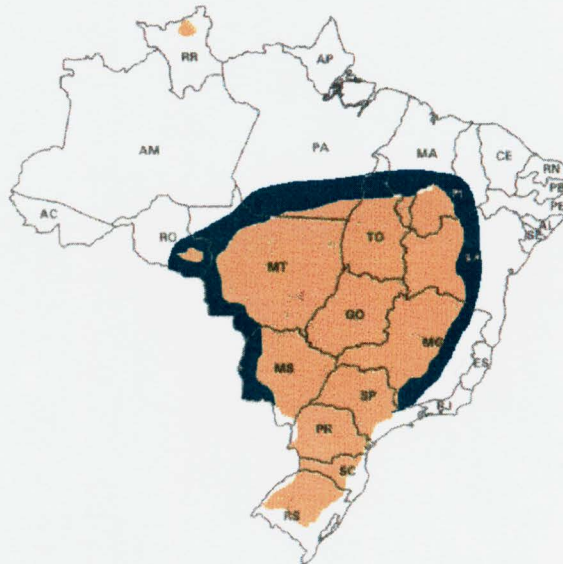
As more companies are investing in Brazil's infrastructure fewer are investing the United States' infrastructure. Because of this, the infrastructure in the United States is slowly deteriorating.

-Future Outlook in Brazil: Brazil is striving to become the number one producer of soybeans in the world and they will most likely reach this goal in the future. No one thought Brazil would be able to produce soybeans in the first place, but they were able to transform the soybean so that it thrived in a tropical climate. Brazil will be able to improve its yields, cultivate more land, and improve its transportation systems. All of these improvements will lead to more soybeans being produced in Brazil. Increased production will also lead to an improved economy in Brazil, which will benefit all citizens of Brazil. Therefore Brazil has the desire to find ways to lower their costs and become a world power.

Soybean production is expected to increase for the years to come in Brazil. The Brazilian Ministry of Agriculture soybean production plans is 1249.16 million bushels (34 million metric tons) in 2001, 1322.64 million bushels (36 million metric tons) in 2002, 1432.86 million bushels (39 million metric tons) in 2003, 1506.34 million bushels (41 million metric tons) in 2004, 1653.30 million bushels (45 million metric tons) in 2005, and 1800.26 million bushels (49 million metric tons) in 2006. This would be a 44% increase in soybean production by 2006. With this increased production planned, more land will need to be put into production. A map follows of the area I believe Brazil will

expand into; the yellow shows what area was planted in 2000 and the green represents the area I believe soybean production will expand to.

Figure 4: Map of Future Expansion in Brazil



Summary and Conclusions

The demand for soybeans continues to increase throughout the world, but supply is also increasing and at a faster rate than demand. There are concerns, especially in the United States, that Brazil has the potential to continue to increase its supply of soybeans in a very short amount of time. The United States has been and continues to be the world's largest producer of soybeans because it has good land types, favorable climate conditions, and well developed infrastructure. However, as Brazil produces more soybeans the United States' advantage is lessening. Brazil has large amounts of land available for expansion and it has production cost advantages, which are allowing it to become more competitive. Refer to Table 6 for comparison of production costs.

Table 6: Comparison of Production Costs

	Ohio	PR, Brazil
Variable Costs:		
Seed	22	9.05
Fertilizer	23	19.15
Chemicals	23	24.31
Trucking- Fuel Only	1	
Fuel, Oil, Grease	8	with repairs
Repairs	5	16.34
Miscellaneous	13	
Interest on Capital	4	11.43
Hired Labor	0	
Total Variable Costs	100	80.28
Fixed Costs:		
Labor Charge	15	3.15
Machinery and Equipment Charge	41	14.52
Land Charge	85	9.98
Management Charge	9	5.53
Total Fixed Costs	150	33.18
Total Fixed Costs	250	113.46

I believe that with the vast amounts of land available for soybean production in Brazil, it will soon begin to produce more soybeans than the United States. However, until Brazil is able to improve its infrastructure it will not gain the competitive advantage in producing soybeans. Currently, improvements are being made to the infrastructure in Brazil. Therefore, Brazil likely will gain the competitive advantage at some point in the future. Once Brazil has a good infrastructure with a variety of ways to transport its goods, transportation costs will decrease and Brazil will gain the comparative advantage.

Even though Brazil may have the advantage in the future, the United States will never stop producing soybeans. United States' farmers will turn to niche markets. I believe in the future Brazil will produce the commodity of soybeans but the United States will produce soybeans for niche markets. Many new uses are being discovered for

soybeans and this will allow United States' farmers to produce soybeans for these new products. Soybeans will continue to be an important product in the future, and the United States and Brazil will each have an important but very different role in meeting the world's demand.

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